

## 2.4

### Exponent Laws I

#### FOCUS

- Understand and apply the exponent laws for products and quotients of powers.

When we multiply numbers, the order in which we multiply does not matter.  
For example,  $(2 \times 2) \times 2 = 2 \times (2 \times 2)$   
So, we usually write the product without brackets:  
 $2 \times 2 \times 2$



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#### Connect

##### ► Exponent Law for a Product of Powers

To multiply powers with the same base, add the exponents.

$$a^m \times a^n = a^{m+n}$$

The variable  $a$  is any integer, except 0.

The variables  $m$  and  $n$  are any whole numbers.

To multiply  $(-7)^3 \times (-7)^5$ :

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## Connect

### ► Exponent Law for a Quotient of Powers

To divide powers with the same base, subtract the exponents.

$$a^m \div a^n = a^{m-n} \quad m \geq n$$

$a$  is any integer, except 0;  $m$  and  $n$  are any whole numbers.

To divide  $8^7 \div 8^4$ :

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### Example 1 Simplifying Products and Quotients with the Same Base

Write each expression as a power.

a)  $6^5 \times 6^4$

b)  $(-9)^{10} \div (-9)^6$

**SOLUTION:**

a)  $6^5 \times 6^4$

b)  $(-9)^{10} \div (-9)^6$

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## YOU TRY!

Write each expression as a power

**SOLUTION:**

a)  $4^2 \times 4^5$

b)

$$(-4)^7 \div (-4)^3$$

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### Example 2 Evaluating Expressions Using Exponent Laws

Evaluate.

a)  $(-2)^4 \times (-2)^7$

b)  $3^2 \times 3^4 \div 3^3$

**SOLUTION:**

a)  $(-2)^4 \times (-2)^7$

b)  $3^2 \times 3^4 \div 3^3$

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## YOU TRY!

Evaluate each expression

**SOLUTION:**

a)  $(-4)^5 \times (-4)^8$

b)  $6^3 \times 6^4 \div 6^6$

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### Example 3

### Using Exponent Laws and the Order of Operations

Evaluate.

a)  $6^2 + 6^3 \times 6^2$

b)  $(-10)^4[(-10)^6 \div (-10)^4] - 10^7$

**SOLUTION:**

a)  $6^2 + 6^3 \times 6^2$

b)  $(-10)^4[(-10)^6 \div (-10)^4] - 10^7$

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# YOU TRY!

Evaluate each expression

**SOLUTION:**

a)  $5^3 + 5^8 \div 5^5$

b)

$$(-4)^3 \left[ (-4)^7 \div (-4)^5 \right] - 4^2$$

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## Discuss the ideas

1. Use your own words to explain how to:
  - a) multiply two powers with the same base
  - b) divide two powers with the same base
2. Do you think it makes sense to simplify an expression as much as possible before using a calculator? Explain.
3. When can you not add or subtract exponents to multiply or divide powers?

## Reflect

When can you use the exponent laws to evaluate an expression with powers?  
When can you *not* use these laws? Include examples in your explanation.

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## Practice

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If Finished in class then attempt these questions

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